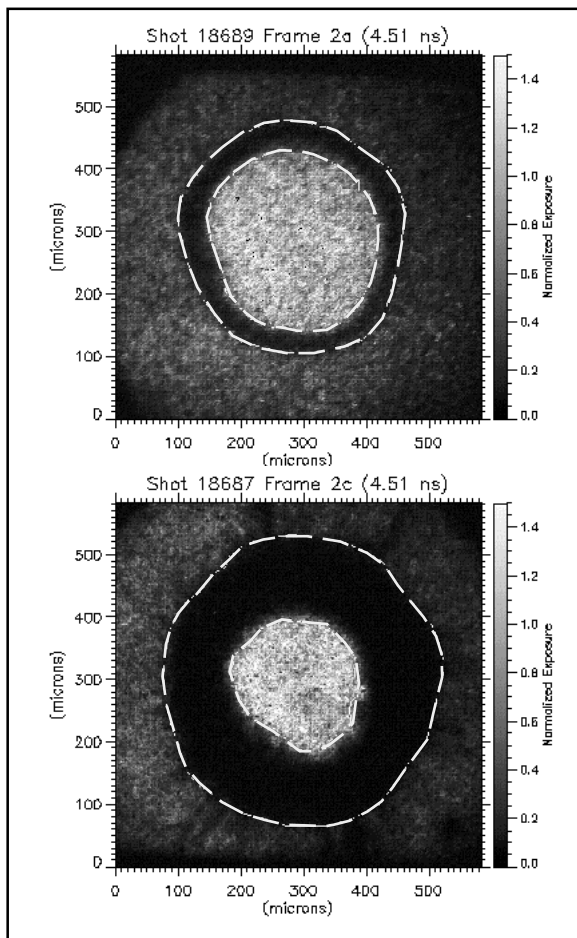




Cylindrical Implosion Mix Experiments

In January, Los Alamos performed a mix experiment that created a measurable region of mixed material in a compressible plasma state in a convergent cylindrical geometry. The experiment used directly driven cylindrical implosions on the OMEGA laser at the Laboratory for Laser Energetics of the University of Rochester. Two targets have been compared. The first is a “low-mix” target with a “smooth” 4- μm -thick dichloropolystyrene marker on the inside of a hollow cylinder,



subsequently filled with foam. The second is a “high-mix” target with 0.8 μm of gold deposited conformally on the central foam that is then inserted into a plain polystyrene ablator. It was predicted that the Richtmyer-Meshkov instability would play a leading role in causing the high-mix system to produce a thicker mix region than the low-mix system. The figure shows typical axial radiographs for both a low-mix (top) and a high-mix

(bottom) case. The frames are chosen to be at the same time during the respective implosions that had incident laser energies within 1.4% of each other. The fundamental result of this work is that we see a relatively thin marker layer with the initially smooth, low-density chlorinated system but a very thick mix region with the initially rough, high-density gold system. Future work will address issues of the initial roughness of the interfaces and the contribution of the Rayleigh-Taylor instability to mix during the gradual deceleration of the cylinder.

For more information contact Steve Batha (sbatha@lanl.gov)

High Pressure Hydrogen Filling of Beryllium

Many ignition capsule designs for the National Ignition Facility (NIF) use beryllium-copper as the ablator material. A typical design has a spherical shell about 2 mm in diameter with a wall thickness of 0.15 mm. This NIF ignition capsule must contain deuterium-tritium gas at a room-temperature pressure of typically 350 atmospheres. Recently, the beryllium capsule fabrication team in MST division has successfully put up to 100 atmospheres of pure deuterium into a beryllium capsule. This capsule fabrication method involves precision-machining a bulk beryllium-copper alloy to produce the two capsule halves with male and female locating surfaces. The interior spherical surface is machined and lapped to the required dimension and finish. A very thin joint braze interlayer of copper or aluminum is vapor-deposited onto the joining surfaces, and the two halves are bonded. While beryllium is normally brazed in high vacuum, the joining for these capsules was done under high pressure deuterium. Both copper surrogate capsules as well as pure beryllium and beryllium-copper alloy capsule experiments have trapped high pressure deuterium. The gas pressures have been confirmed by weight gain and by burst measurements. The burst test is done in a custom-made apparatus that fractures the capsule inside a very controlled volume. The pressure difference before and after burst measures the capsule fill. As these experiments have been performed with cylinders containing the interior spherical surfaces, a remaining challenge is to machine the outer spherical surface to produce the hollow capsule. These capsules are also being used in a developmental effort to detect non-destructively the trapped gas by resonance ultrasound spectroscopy.

For more information contact Robert Margevicius (margevicius@lanl.gov)